

ADA198163

50272-101

REPORT DOCUMENTATION PAGE		1. REPORT NO. DOD/SW/MT-88/0170	2.	3. Recipient's Accession No.
4. Title and Subtitle An Overview of the Navy Occupational Health Information Management System (NOHIMS)			5. Report Date May 1988	
7. Author(s) L. A. Hermansen, W. M. Pugh			8. Performing Organization Rept. No. 88-14	
9. Performing Organization Name and Address Naval Health Research Center P. O. Box 85122 San Diego, CA 92138-9174			10. Project/Task/Work Unit No. M0095.05-1053	
			11. Contract(C) or Grant(G) No. (C) (G)	
12. Sponsoring Organization Name and Address Naval Medical Research and Development Command Bethesda, MD 20814-5044			13. Type of Report & Period Covered Final as of May 1988	
			14.	
15. Supplementary Notes For magnetic tape, see: ADA198157				
16. Abstract (Limit: 200 words) The Navy Occupational Health Information Management System (NOHIMS) is an integrated computer system developed to assist the Navy in meeting occupational health and safety requirements. The history and design of NOHIMS is described. Details about the system's various modules and their functions are provided. An operational scenario which demonstrates how NOHIMS can facilitate an occupational safety and health program at a Navy shipyard is presented. <i>Keywords: Management information systems, Industrial hygiene, Occupational health, Medical information systems, Workplace monitoring, Environmental monitoring</i>				
17. Document Analysis a. Descriptors Industrial Hygiene, Occupational Health, Medical Information Systems, Medical Monitoring, Workplace Monitoring, Environmental Monitoring b. Identifiers/Open-Ended Terms c. COSATI Field/Group				
18. Availability Statement Release Unlimited		19. Security Class (This Report) Unclassified		21. No. of Pages 16
		20. Security Class (This Page) Unclassified		22. Price Free



5010-108-01

See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

AN OVERVIEW OF THE
NAVY OCCUPATIONAL HEALTH INFORMATION MANAGEMENT SYSTEM
(NOHIMS)

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Accession For	
NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
<i>NTIS PC-12-95</i> <i>MF-6-95</i>	
Availability Codes	
Dist	Avail and/or Special
A-1	21

Report No. 88-14, supported by the Naval Medical Research and Development Command, Department of the Navy under work unit M0095.005-1053. The views expressed in this article are those of the authors and do not reflect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government. Approved for public release; distribution unlimited.

SUMMARY

The Navy Occupational Health Information Management System (NOHIMS) is an integrated computer system developed at the Naval Health Research Center to assist the Navy in meeting the requirements of the Occupational Safety and Health Act of 1970 and Navy Occupational Safety and Health directives. The primary objectives of NOHIMS are to:

- o monitor workplace hazards and exposures;
- o identify all employees at risk;
- o ensure employees receive proper medical surveillance; and
- o store data for trend analyses, epidemiological studies, and program compliance monitoring.

NOHIMS software is written in MUMPS computer language and consists of a medical component and an environmental component. It uses the COSTAR (COMputer STored Ambulatory Record) for the medical component and Veteran's Administration File Manager software for the environmental component.

Within each of these components there are several modules which are used to process different types of data. The medical component (COSTAR) contains the following modules:

Patient Registration. This module provides the ability to capture, update, and display all identifying and demographic information required to establish a patient's medical records.

Enter Medical Data. This module is used to enter or edit physical examination information and results of laboratory tests including audiometry, spirometry, urinalysis, and blood chemistry.

Display Medical Data. This module allows the user to print or display data in the medical record of a patient in a variety of formats and sequences.

COSTAR Report Generator. This module provides statistical data on medical records stored in COSTAR. Specifications for the reports are defined by the user and can be modified to suit user needs. The module allows the user to select conditions and then create lists and/or tables. The report formats can be created for one-time use and then deleted, or saved for routine use, as in a monthly morbidity report.

Mailbox. This electronic mail system is used to send and receive messages. Users are notified of a mail message when they log on to the system. Mail can be sent to any or all users with access to the system.

System Maintenance. This module is used by the system manager for transaction control functions, security functions, directory work, and generating software performance reports.

The environmental component of NOHIMS is based on the VA Filemanager package which is used to implement the following modules:

Administration. This module is used to maintain data about the agency's organizational units (departments, divisions, shops, etc.), personnel, occupations, operations, stressors, and locations. This module is essential since its files are referenced by other modules in the system.

Environmental Exposure. This module is used to maintain industrial hygiene survey data. It provides lists of stressors in the environment and reports when survey actions are due or overdue. It maintains required records of operations performed and maintains the calibration data on instruments used for sampling.

Medical Exam Scheduling. The medical exam scheduling module is used to schedule appointments, generate appointment notices and exam protocols for individual workers, track their medical qualification status, and maintain medical exam protocols for specified stressors, occupations and operations.

Hazardous Materials Control. The hazardous materials control module tracks the movement of hazardous materials through the facility, generates health and safety hazard reports for specified hazardous materials, and maintains records of requests for hazardous material specifications.

In addition to the above modules, NOHIMS interfaces with modules developed to manage various occupational safety functions, including injury compensation and claims, hazard deficiency abatement, and safety and health training.

It can be seen that NOHIMS has been developed into a comprehensive system for occupational health and safety. With NOHIMS, the efforts of occupational health physicians and nurses, industrial hygienists, safety specialists, and claims and compensation managers can be coordinated. The first system was installed at the Navy Medical Clinic in Portsmouth, New Hampshire. Over the next five years the Navy Environmental Health Center will implement NOHIMS at twenty separate sites. This will be accomplished using technical support provided by the Navy Regional Data Automation Center, Washington, DC.

AN OVERVIEW OF THE NAVY OCCUPATIONAL HEALTH INFORMATION MANAGEMENT SYSTEM (NOHIMS)

Introduction

The Navy Occupational Health Information Management System (NOHIMS) is an integrated computer software and hardware system that was developed to assist the Navy in meeting the requirements of the Occupational Safety and Health Act of 1970 and the implementation of DODINST 6055.5M¹ and OPNAVINST 5100.23B². The primary objectives of NOHIMS are to 1) monitor workplace hazards and exposures, 2) identify all employees at risk, 3) ensure employees receive proper medical surveillance, and 4) store data for trend analyses, epidemiological studies, and program compliance monitoring. NOHIMS will facilitate improvements in the quality of the Navy Occupational Safety and Health (NAVOSH) program and will enhance the delivery of occupational health services to Navy employees working in Navy industrial facilities.

History

The Naval Health Research Center (NHRC), located in San Diego, California was tasked by the Naval Bureau of Medicine and Surgery (now the Naval Medical Command) to develop a computerized occupational health monitoring system after the requirement for automation was identified at a conference on Navy occupational health held at the Battelle Human Affairs Research Centers in Seattle, Washington on January 29-30, 1979³. The first step taken by NHRC was to complete a systems analysis of the Navy's existing occupational health monitoring systems in order to determine the functional requirements of an automated system. After completion of this analysis, NHRC began a review and evaluation of computerized occupational health monitoring systems that were available commercially. The available systems were evaluated in terms of meeting minimum Navy requirements, cost, and adaptability to the Navy's industrial environments. Because no system was found that met the Navy's requirements, it was decided that NHRC would develop a prototype system⁴ which would be implemented at two facilities, one in San Diego, California and one in Bremerton, Washington for a trial period. The first prototype system was installed in June 1981 at the Naval Air Rework Facility (now the Naval Aviation Depot) at North Island in San Diego.

After successful testing and operation of the prototype systems, work began on an enhanced version with input from the Naval Medical Command and the Naval Sea Systems Command. This enhanced version (NOHIMS Version 2.0) included numerous occupational safety functions which were not in Version 1.0, as well as additional environmental and medical functions.

In order to optimize the interface between the safety and health functions, the Naval Medical Command and the Naval Sea Systems Command joined efforts to procure a common software/hardware operating environment. The Veterans Administration (VA) Filemanager software package was chosen to integrate the NOHIMS environmental functions and the Naval Sea Systems Command's safety functions. The operating environment, which was selected through a competitive procurement process, consisted of Intersystem's VMS operating system supporting the M/VX MUMPS package running on a Digital Equipment Corporation's VAX 8200 series computer.

The Navy Regional Data Automation Center (NARDAC) in Washington, DC was tasked to provide technical support and training to the sites during implementation. NARDAC was also made responsible for system software maintenance functions. A total of twenty NOHIMS installations, called service points, are planned. These service points will serve over 150 different locations, or remote sites, which will be networked via the Department of Defense's long haul communications system known as the Defense Data Network (DDN). The first site to receive NOHIMS Version 2.0 was the Naval Medical Clinic, Portsmouth, New Hampshire. The installation took place in April 1987.

Design

NOHIMS Version 2.0 contains two primary components: a medical component and an environmental component (see figure 1). The Computer Stored Ambulatory Record System (COSTAR)⁵ is used to implement the medical component, and software developed using VA Filemanager is used to implement the environmental component.

Medical Component

The medical component of NOHIMS uses the COSTAR package to maintain medical records and to generate statistical reports. It is a directory driven

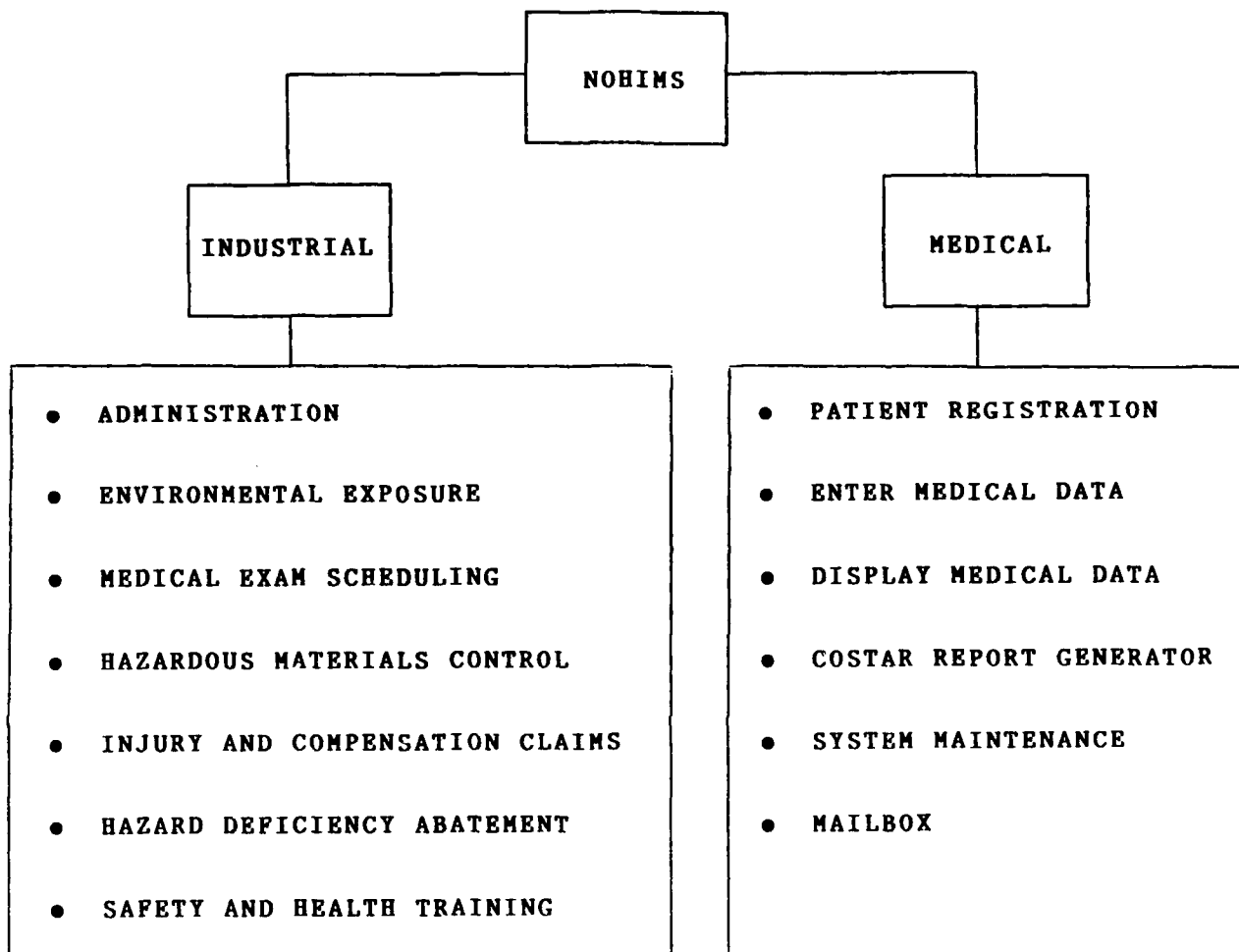


Figure 1

system that allows the user to define custom data collection forms, also called encounter forms. The standard COSTAR functions used in NOHIMS include patient registration, medical data entry, medical data display, a report generator, electronic mailbox, and system maintenance.

The registration function is used to establish individual patient records. Information about a person which remains stable is entered into the medical record on a one-time basis. For example, data such as sex, date of birth, or, for military personnel, branch of service, is recorded. Options exist for correcting or updating these data if necessary.

The Enter Medical Data option allows the user to enter information from user-defined encounter forms. Data entry forms are used to capture such information as the health care provider's name, the patient's vital signs, physical exam results, laboratory test results, diagnoses, treatments provided, and disposition. The Enter Medical Data option also allows for entry of free text into a patient's medical record.

The Display Medical Data capability allows the user to retrieve medical data on an individual. The user must first identify the patient's record by name or social security number. Then the user may print or display data in the medical record of the patient in a variety of formats and sequences.

The Report Generator function provides statistical data on medical records stored in COSTAR. Specifications for the reports are defined by the user and can be modified to suit user needs. The module allows the user to select conditions and then create lists and/or tables. The report formats can be created for one-time use and then deleted, or saved for routine use, as in a monthly morbidity report.

The Electronic Mail system is used to send and receive messages. Users are automatically notified if there is a mail message for them when they log on to the system. Mail can be sent to any or all users with access to the system.

The System Maintenance function is used by the system manager for transaction control functions, security functions, directory work, and for generating software performance reports.

Environmental Component

The environmental component contains separate modules which are used to process different types of environmental data. They include the Administration Module, Environmental Exposure Module, Medical Exam Scheduling Module, and the Hazardous Materials Control Module. In addition, these occupational health modules interface with three other modules which are used for managing safety functions. These include the Injury and Compensation Claims Module, Hazard Deficiency Abatement Module, and the Safety and Health Training Module. The seven modules are linked together using the VA Filemanager software package.

Occupational Health Modules

The key module in the system is the Administration Module. It provides the main linkage for the system, since the files contained in it are referenced by all six environmental modules. Its function is to maintain data about the facility's organizational units (departments, divisions, shops, etc.), employees, stressors, operations, and locations. The six major files maintained in the Administration Module are shown in figure 2.

The Environmental Exposure Module maintains industrial hygiene survey data collected by industrial hygienists and workplace monitors at the facility. It uses these data to provide lists of stressors in each of the environments at the facility when requested. It provides lists of workers who are exposed to stressors at or above specified action levels, then it automatically generates exposure notices for those employees. It automatically generates reports that inform the user when survey actions are due or overdue. It also assists the industrial hygienists in developing workplace monitoring plans for the facility. It maintains the inventory of the sample collection instruments used by the industrial hygienists and workplace monitors, and finally, it keeps track of calibration data for each of those sampling instruments.

**MAJOR FILES ASSIGNED TO THE ADMINISTRATIVE MODULE
THAT ARE USED BY ALL SIX MODULES**

- AGENCY UNITS
- EMPLOYEES
- LOCATIONS
- STRESSORS
- OCCUPATIONS
- OPERATIONS

Figure 2

The primary function of the Medical Exam Scheduling Module is to ensure that all workers at the facility receive proper medical surveillance based on their exposures to stressors, their occupation types, or the processes (operations) in which they are involved. The module maintains specific medical exam protocols for each of these stressors, occupations, and processes. It provides the option to automatically enroll workers in these medical surveillance programs. It also tracks the medical qualification and/or job certification status of each worker. It supports automatic or manual scheduling of appointments for the clinic and generates appointment notices and medical exam protocols for each worker who needs an exam. Finally, it keeps track of whether or not a worker showed up for his or her scheduled medical exam appointment, and if not, it allows the health care provider to reschedule the appointment for a future date.

The Hazardous Materials Control Module is used to track the movement of hazardous materials through the facility from the day they arrive at the facility to the day they are used in a process or are removed from the facility. Information about the materials is maintained and updated using the Hazardous Materials Information System (HMIS) files which are provided by the Defense Logistic Agency (DLA) and disseminated to NOHIMS service points by the Navy Environmental Health Center (NEHC) through the Navy Regional Data Automation Center (NARDAC). These files contain information about the important characteristics of the materials (ingredients, first-aid procedures, etc.) and are provided by the manufacturer of the materials on Material Safety Data Sheets (MSDSs),⁶. Health and safety hazard reports about any of the hazardous materials information contained in these files can be generated as needed. The reports, called "Worker Data Sheets", are then provided to workers who request them as required by NAVSUP Instruction 5100.27⁷. Finally, the module keeps track of which workers have requested and received "Worker Data Sheets" and when they received them.

Safety Modules

As mentioned earlier, the occupational health modules described above can be interfaced with three additional modules developed to facilitate the Navy's Safety Program, thus creating a comprehensive occupational health and safety program. Descriptions of these safety modules are provided below.

The Injury and Compensation Claims module provides injury and compensation claims information to NAVOSH Offices and to Offices of Workers' Compensation Program (OWCP). It maintains a log of reported incidents, records the claims and compensation information used to manage the safety and health program, and automatically generates facsimiles of the various Department of Labor (DOL) federal employee compensation forms (CA Forms) which are used in the claims process. It also generates statistical and summary reports on safety incidents, as well as the required Department of Defense (DOD), DOL, and OWCP reports.

The Hazard Deficiency Abatement module maintains data about reported hazard deficiencies in the facility. When a deficiency (hazardous condition) is reported to the NAVOSH office, this module is used to record information about the hazard and to generate deficiency notices which are sent to the appropriate supervisor, manager, or officer-in-charge of the area where the problem exists. If the deficiency is not corrected within a certain period the module automatically generates follow-up deficiency notices which are sent to successively higher levels in the chain of command until the problem is resolved. It tracks the status of abatement projects and provides other information as required.

The Safety and Health Training module maintains data on required safety and health training courses. In order for an employee to be qualified to work in some occupations or operations, or with certain hazardous substances or stressors, the employee may be required to complete a training course dealing with the subject. This module tracks the courses, classes (a course may consist of several classes or meetings), instructors, employee course requirements, employee class attendance history, and employee qualification status for all employees at the facility. It also tracks which courses are required for qualification to work in a specific occupation or operation or with a specific stressor. The module determines who is due for training by checking each employee's course requirements, the date the employee was last trained, and the retraining frequency for the course. A list of employees due for training and a list of classes are distributed to all the shops, and each shop decides which classes its employees will attend. The employees are enrolled in the class, a class list is generated for the shops, and the instructor and

each employee are notified of the class time and place. At the end of the course or after the last class session, the instructor sends to the training office an attendance list with each employee's qualification status.

Operational Scenario

The following operational scenario is presented as an example to demonstrate the use of NOHIMS.

- o The NOHIMS Navy Shipyard (NNS) hired Mr. John Doe as a painter.
 - MODULE -- Administration
 - OPTION -- Personnel (or Automatic, through NCPDS)

- o Mr. Doe received a pre-employment examination which revealed no medical conditions adverse to his employment at NNS as a painter. Because prior industrial hygiene reports of painting areas showed exposure to inorganic lead and organic tin, the examining physician, Dr. James W. Smith, placed Mr. Doe in medical surveillance programs for organic tin compounds and inorganic lead.
 - MODULE -- Medical Exam Scheduling
 - OPTION -- Enrollment

- o Dr. Smith also included Mr. Doe for annual physical examinations as part of his Respiratory Protection Program.
 - MODULE -- Medical Exam Scheduling
 - OPTION -- Enrollment (or Automatic, if employee has an occupation which is linked to a program)

- o One year after his initial employment, Mr. Doe received his annual physical examination which showed no significant abnormalities.
One month after the annual examination, Mr. Doe returned to the NNS Occupational Medical Clinic complaining of intense itching about his left wrist and forearm. LCDR Barbara Hebrew, MC, USN, noted a dry, non-scaling rash in that area. Mr. Doe stated that two days prior to the onset of the rash, he was spray painting with an Anti-Fouling Paint on a ship in drydock number one.

He affirmed he was wearing a supplied air respirator that the safety manager issued to him prior to undertaking the spray operation. In addition to wearing the respirator, Mr. Doe stated he wore protective coveralls.

MODULE -- Environmental Exposure

OPTION -- Samples Report

- o On close questioning, LCDR Hebrew determined that Mr. Doe had NOT taped the coveralls at the wrist. While Mr. Doe denied skin contact with the paint during the spraying operation, he admitted that the sleeves of the coveralls could have easily contacted the paint and his wrist.

LCDR Hebrew reviewed the industrial hygiene reports of drydock number one.

MODULE -- Environmental Exposure

OPTION -- Samples Reports

- a) The industrial hygienist, Mr. Jeff Stamm, took air in during the spraying operation.

- * Results - Stressor: Organic Tin

- Measured: 4.0 mg/m³

- PEL: 0.1 mg/m³

- * A notation in Mr. Stamm's survey report indicated that an emergency eyewash station in the paint mixing area of Drydock number one was not available.

- * Persons in the area during the survey included John Doe.

- b) During a similar operation four months earlier, another hygienist, LT Merlyn Richards, had taken noise samples.

- * Results - Stressor: Noise

- Measured: 90 dBA

- PEL: 84 dBA

- o LCDR Hebrew noted that the airborne levels of organic tin exceeded the Permissible Exposure Level (PEL).

MODULE -- Environmental Exposure

OPTION -- Over MSAL Compile

Over MSAL Results List

- o LCDR Hebrew diagnosed a contact dermatitis due to organic tin exposure. She treated him with topical hydrocortizone cream applied to the area of the dermatitis. She instructed him on the importance of skin protection during painting and rescheduled him for a follow-up visit in three days.

MODULE -- Medical Exam Scheduling

OPTION -- Schedule Medical Appointments

- o Mr. Doe requested Worker Data Sheets on anti-fouling paints.

MODULE -- Hazardous Material Control

OPTION -- Worker Data Sheet Print

- o LT Richards retrieved the Material Safety Data Sheets on these paints.

MODULE -- Hazardous Material Control

OPTION -- MSDS Print

LCDR Hebrew placed Mr. Doe on limited duty for one week.

- o On Mr. Doe's return to the clinic, Nancy Wilson, RN, Occupational Health Nurse, examined his left wrist. The rash had cleared so she issued a chit for return to full duty. Because of the over-exposure to noise, nurse Wilson also entered Mr. Doe in the Hearing Conservation Program.

MODULE -- Medical Exam Scheduling

OPTION -- Enrollment

- o Information about all of Mr. Doe's visits to the NNS Occupational Medical Clinic was documented on medical encounter forms and then entered into the medical component of NOHIMS. These data were retrieved by the health care providers at the clinic whenever they needed to look at Mr. Doe's medical record. Data from his and all other visits to the clinic during each month were used to automatically generate summary morbidity and workload reports that provided information for better management of the clinic's resources.

MODULES -- Patient Registration

Enter Medical Data

Display Medical Data

COSTAR Report Generator

Conclusion

One can see from this brief scenario that NOHIMS is a comprehensive system that will facilitate monitoring the health and safety of Navy workers in industrial settings. It will also provide a means to standardize and store diverse information in one system that can be utilized by professionals from all the different branches that make up the occupational health field in order to improve program management and worker safety and health.

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REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS None		
2a. SECURITY CLASSIFICATION AUTHORITY N/A			3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) NHRC Report No. 88-14			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION Naval Health Research Center		6b. OFFICE SYMBOL (If applicable) Code 20	7a. NAME OF MONITORING ORGANIZATION Commander, Naval Medical Command		
6c. ADDRESS (City, State, and ZIP Code) P. O. Box 85122 San Diego, CA 92138-9174			7b. ADDRESS (City, State, and ZIP Code) Department of the Navy Washington, DC 20372		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION Naval Medical Research & Development Command		8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code) Naval Medical Command National Capitol Region Bethesda, MD 20814-5044			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO. 63706N	PROJECT NO. M0095	TASK NO. .05
			WORK UNIT ACCESSION NO. 1053		
11. TITLE (Include Security Classification) (u)AN OVERVIEW OF THE NAVY OCCUPATIONAL HEALTH INFORMATION MANAGEMENT SYSTEM (NOHIMS)					
12. PERSONAL AUTHOR(S) Hermansen, L.A., Pugh, W.M.					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM TO	14. DATE OF REPORT (Year, Month, Day) 23 March 1988		15. PAGE COUNT 19
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Industrial Hygiene, Occupational Health, Medical Information Systems, Medical Monitoring, Workplace Monitoring, Environmental Monitoring		
19. ABSTRACT (Continue on reverse if necessary and identify by block number) The Navy Occupational Health Information Management System (NOHIMS) is an integrated computer system developed to assist the Navy in meeting occupational health and safety requirements. The history and design of NOHIMS is described. Details about the system's various modules and their functions are provided. An operational scenario which demonstrates how NOHIMS can facilitate an occupational safety and health program at a Navy shipyard is presented.					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL Lawrence A. Hermansen			22b. TELEPHONE (Include Area Code) 619/553-8402	22c. OFFICE SYMBOL Code 20	